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(54) Joints in frame structures

(57) A load supporting structure which may comprise scaffold elements (20) provided with co-operating spigot parts (13) and socket parts (15) to enable interconnection of the members (10) and prevent relative movement transverse to the axis of movement to effect connection of the members (10). The socket (15) may be formed as an extrusion as may the spigot (13). The invention has particular application to scaffolding frames and assemblies for forming scaffold towers.

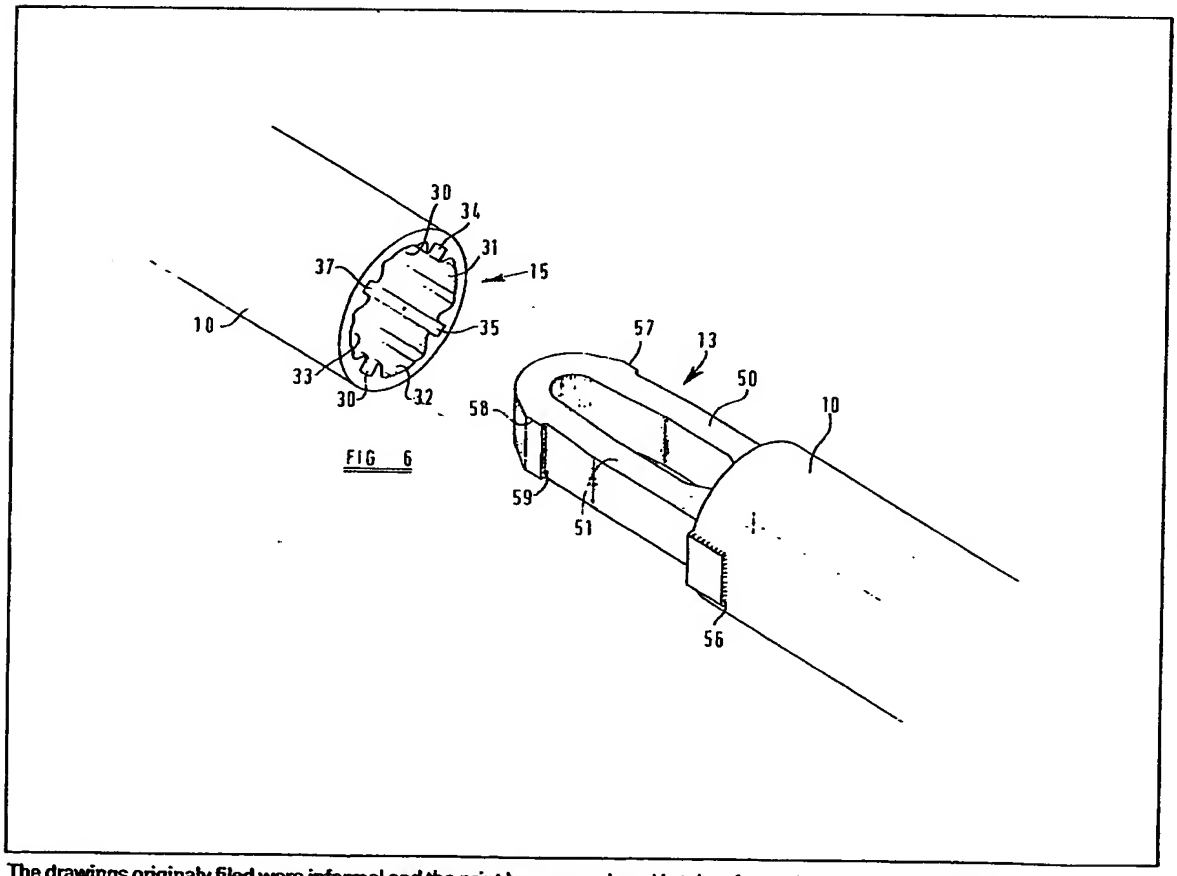

FIG 6

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The drawings originaly filed were informal and the print here reproduced is taken from a later filed formal copy

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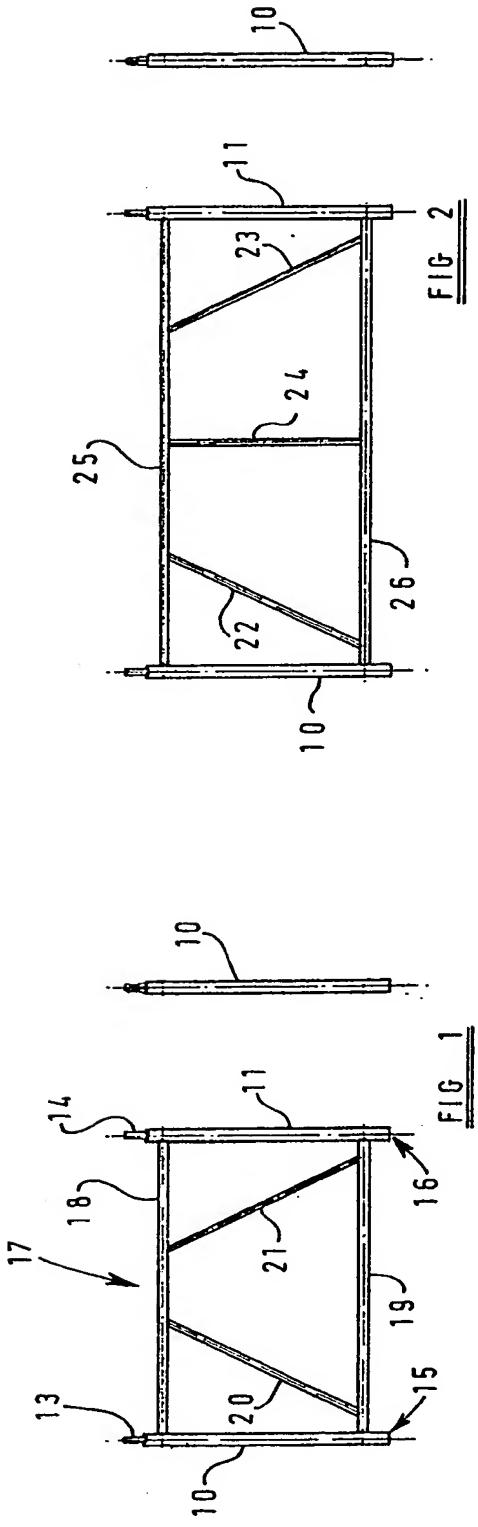

FIG 2

FIG 1

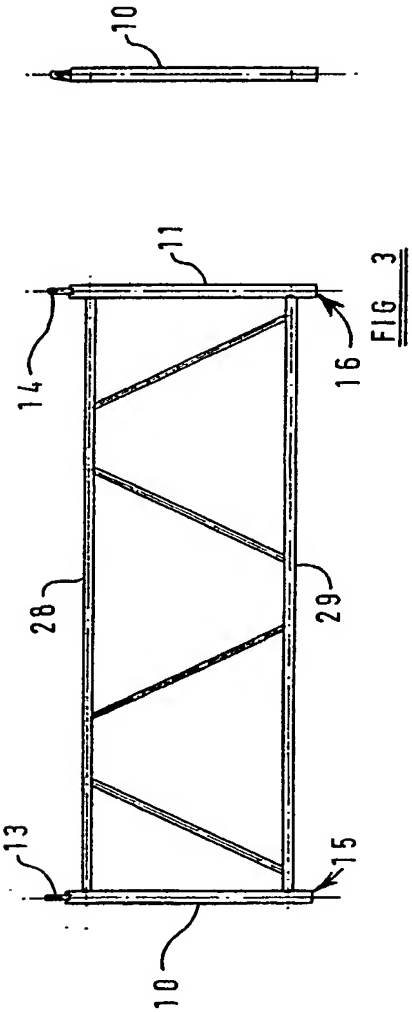

FIG 3

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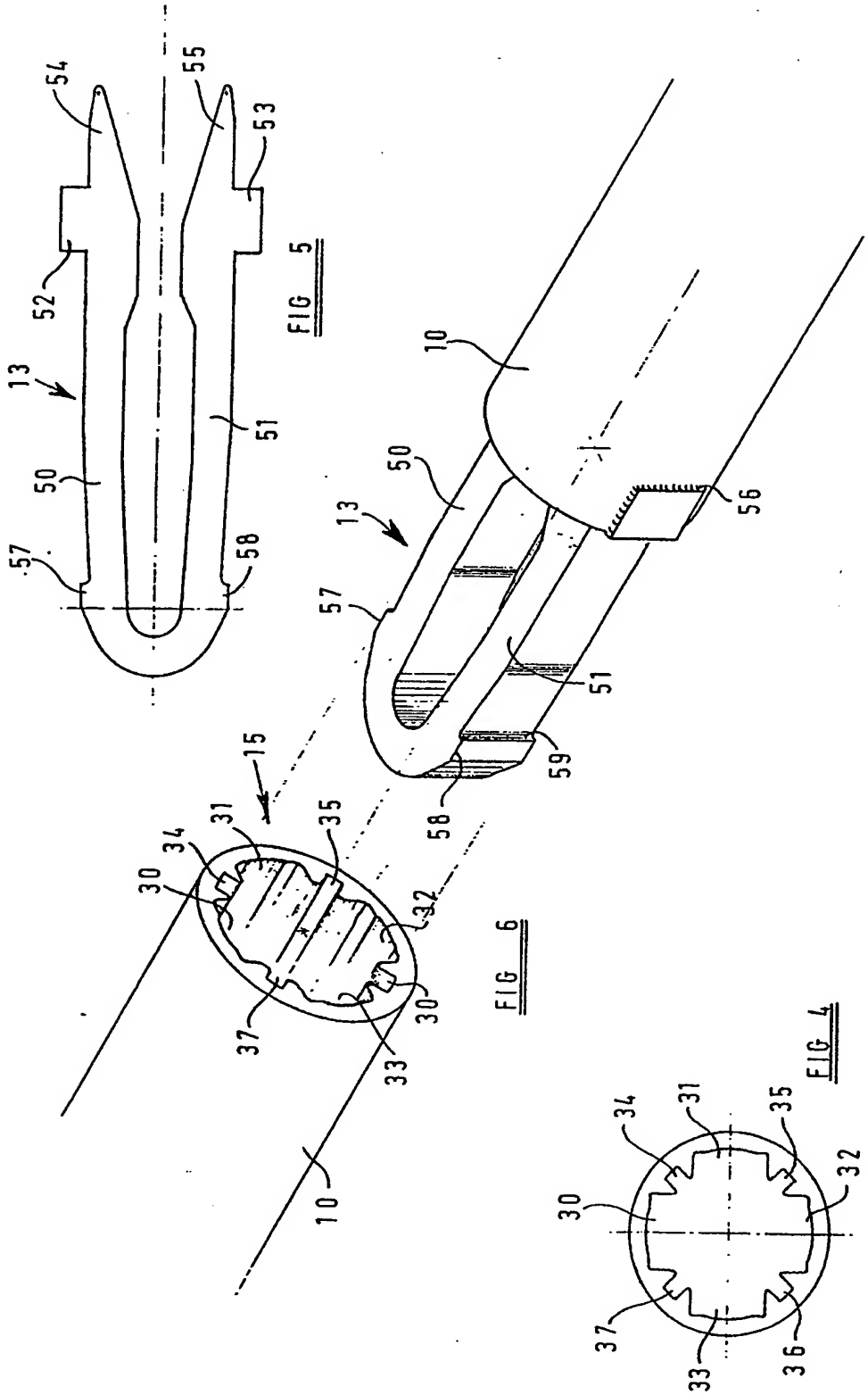
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FIG 4

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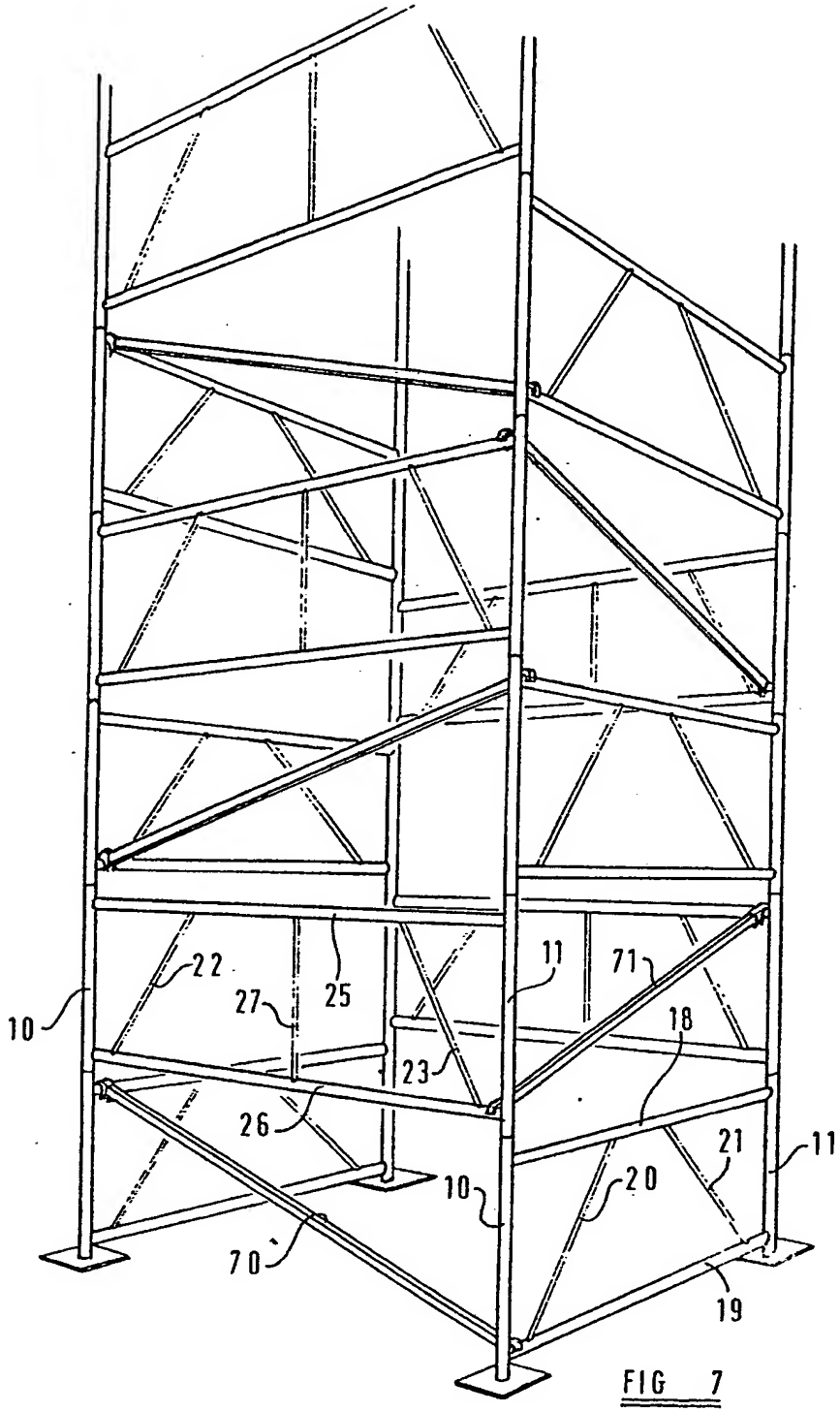

FIG 7

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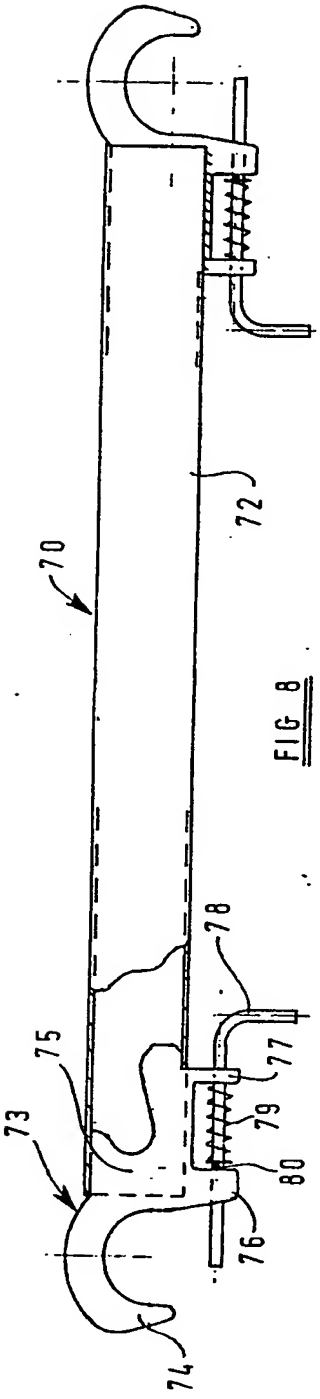

FIG 8

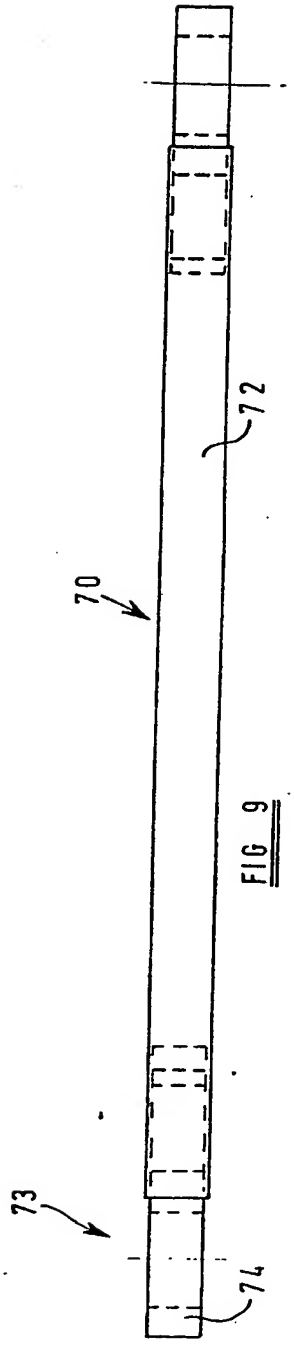

FIG 9

SPECIFICATION

Improvements in or relating to load supporting structures

This invention relates to load supporting structures and has particular but not exclusive application to scaffolding.

It is desirable with load supporting structures and in particular scaffolding to enable simple and secure location of one piece relative to another in order that the desired structure may be completed in as short a time as possible as well as providing a structure of adequate strength and stability.

Pieces of scaffold have traditionally been connected together by means of various types of brackets and connectors, and in order to provide a scaffold structure which may be assembled more quickly, various types of scaffold towers are available, such a scaffold tower comprising a plurality of preformed frames, each frame being adapted to interconnect with adjacent frames so as to form a tower.

The method of interconnecting adjacent frames of known scaffold towers, which frames generally comprise a pair of tubular upright members, each pair of upright members being connected by a transverse member or ladder-type frame, has been to provide at one end of said upright members a socket and at the other end a spigot adapted for insertion into the socket of another frame.

The upright members are usually made from tubular material having an annular cross-section which readily provides a socket, the spigot being formed by either securing a piece of tube or rod of smaller diameter to the tubular upright member or alternatively swaging or otherwise reducing the diameter of one end of the tubular upright member such that the external diameter of the reduced part is not greater than the internal diameter of the remainder of the tubular upright member, so that they will fit within the unswaged ends of other tubular upright members.

Scaffold towers formed in such a manner suffer from the disadvantage that, particularly when built as a tower having a square formation, in order to give the tower stability diagonal cross pieces are necessary to interconnect diagonally opposed upright tubular members. Furthermore, difficulty is uncurred if it is necessary to lock two adjacent frames in assembled relationship since even if respective holes are provided, one in the socket and one in the spigot, through which a pin may be passed alignment of the holes is difficult.

It is an object of the present invention to provide an improved load supporting structure.

According to one aspect of the present invention, I provide a load supporting structure comprising a plurality of members each of which is adapted to be secured to another of said members to form said structure, at least one of said members comprising a socket part and another of said members comprising a spigot part, the dimensions of which parts enable the spigot part to be inserted into the socket part, the form of the socket part and said spigot being such that relative rotation between the respective members comprising the socket part and the spigot part about an axis along which the relative parts are moved into and out of assembled relationship is prevented.

Preferably the configuration of said socket part and said spigot part enables the respective members carrying said parts to be assembled in a plurality of different angular positions and conveniently the cross-section of said socket part in a plane substantially at right angles to said axis may comprise a cruciform.

The spigot part may be of rectangular form in cross-section adapted to engage within diametrically opposed arms of said cruciform.

Preferably said spigot comprises a pair of spaced elements interconnected at least at one end to provide a cross-section of substantially rectangular outline and defining a gap provided by the spacing of said elements intermediate the ends of the rectangle.

The socket part preferably has an outer surface of a configuration different from the inner surface and is preferably formed as an extrusion.

It is another object of the present invention to provide a pair of scaffold elements adapted to be connected to each other.

According to a second aspect of the present invention I provide a pair of scaffold elements adapted to be connected to each other, one of said elements defining a socket and the other a spigot, the dimensions and form of said socket and said spigot being such that they may be moved into and out of assembled relationship with each other along an axis and when in assembled relationship defined by insertion of said spigot into said socket relative angular movement between said elements being prevented.

Preferably the form of said socket and said spigot are such that said elements may be put into assembled relationship with each other in a plurality of different relative angular relationships about said axis.

Preferably said scaffold elements are of tube-like configuration and have an outer surface of conventional size and form which corresponds to existing scaffold elements and the inner surface of said element defining said socket part is of a different form from its outer surface. Preferably the element defining said socket part is formed as an extrusion, and conveniently the inner surface has a cruciform-like cross-section.

The spigot part may be adapted to be secured within the tubular member and extend outwardly therefrom in a direction along the longitudinal axis of the tubular element, the cross-section of the spigot being of generally rectangular configuration to engage within diametrically opposed arms of said cruciform.

Preferably said spigot, whilst defining a generally rectangular outline in cross-section has a central gap extending in a direction along the longitudinal axis of the tubular member and spigot, the end of the spigot most remote from the tubular member being continuous in that no gap is present at said remote

end.

Preferably said spigot may be of elongated U-form, the lower end of the U comprising the outer end of the spigot, i.e. that most remote from the tubular member, the two ends of the U being inserted into the tubular member and secured therein by welding for example.

Preferably, a pair of protrusions are provided adjacent the lower end of the U, said protrusions being diametrically opposite each other and extending outwardly of said spigot by an amount such that the distance between the extremities of such protrusions is substantially the same as, but not greater than, the distance between diametrically opposed surfaces of the socket into which the spigot extends.

The provision of such protrusions enables the spigot to be tapered while preventing rocking of the spigot in its respective socket.

It is a still further aspect of the present invention to provide a scaffold tower having at least three sides and at least partially assembled from scaffolding frameworks or sub-assemblies wherein each sub-assembly or framework comprises a pair of tubular upright members adapted to extend with their longitudinal axis substantially vertically when in assembled relationship, said upright tubular members being interconnected by a connecting member, one or each of the tubular upright members being provided with a spigot and the other end of said one or each of the tubular members being provided with a socket wherein the configuration of the spigot and socket permits of interconnection between adjacent frames by insertion of the spigot of one frame into the socket of another and, on connection prevents relative rotation between adjacent connected frames about the longitudinal axis of the interconnected tubular members.

Preferably each tubular member has an internal cross-section differing in form from the external cross-section and conveniently the external cross-section is circular and the internal cross-section comprises a cruciform.

Preferably the tubular members are made as an extrusion and conveniently they are formed from an aluminium alloy.

Preferably the spigots are also formed as an extrusion which conveniently may be a aluminium alloy and are of a form such that they may be secured by welding, for example, into the tubular members, the internal cross-section of which is adapted to securely locate part of the spigot extending therein.

Preferably adjacent frames may be secured together in a plurality of different relative angular positions which conveniently are at right angles to each other about the longitudinal axis of the tubular members.

The invention will now be described in more detail by way of example only with reference to the accompanying drawings wherein:-

Figure 1 is a side and end view of one scaffold frame of the present invention;

Figure 2 is a side and end view of another scaffold frame;

Figure 3 is a side and end view of a further scaffold frame;

Figure 4 is a sectional view of a socket;

Figure 5 is a view of a spigot;

Figure 6 shows a detailed perspective view of a spigot and socket in spaced relationship;

Figure 7 shows a scaffold tower in assembled relationship;

Figures 8 and *9* show a diagonal bracing strut.

Referring first to Figures 1, 2 and 3, scaffold frames which may be component parts of scaffold towers are illustrated.

The scaffold frame shown in Figure 1 comprises uprights 10 and 11 which uprights are tubular and have respective spigots 13 and 14 at one end thereof and respective sockets 15 and 16 at the other end.

Interconnecting the uprights 10 and 11 is a ladder-type framework 17 comprising elongate members 18 and 19 which themselves are interconnected by inclined struts 20 and 21.

All the elements of the frame shown in Figure 1 may be made from any suitable material, for example steel or aluminium alloy, and may be interconnected by any suitable manner and are preferably welded to each other.

Figure 2 illustrates a similar frame to that shown in Figure 1 having a pair of identical upright members 10 and 11, however in this case they are connected by a ladder-type frame which is longer than that shown in Figure 1 and comprises elongate members 25 and 26 interconnected by struts 22, 23 and 27.

Figure 3 illustrates a further frame similar to those shown in Figures 1 and 2, the frame shown in Figure 3 has uprights 10 and 11 having respective spigots 13 and 14 and sockets 15 and 16, elongate members 28 and 29 interconnected by inclined bracing struts similar to those shown in Figures 1 and 2.

Referring now to Figures 4, 5 and 6, the configuration of the sockets 15 and 16 and spigots 13 and 14 will now be described in more detail. The uprights 10 and 11 have a cross-section as shown in Figures 4 and 6. The external surface is circular and conforms in size to conventional scaffolding poles. The internal cross-section is of cruciform-like configuration having four arms 30, 31, 32, and 33 between which are formed notches 34, 35, 36, and 37. The notches have the advantage of not only saving material but also impart some resilience to the side walls, for example 39 and 40 of the arm 30 of the arms of the cruciform.

The uprights 10 and 11 are preferably formed as an extrusion and an aluminium alloy, such as that made in accordance with the specification H.E.30 T.F., is a suitable alloy.

The cross-section of the extruded upright members 10 and 11 imparts a high degree of both bending and torsional rigidity to the members of the combination of a circular outer surface assisting in torsional rigidity and the cruciform inner cross-section assisting in bending rigidity.

Referring now in addition to Figure 5, the spigot 13 is illustrated, which spigot comprises a U-shaped member having two arms 50 and 51, the arms 50 and 51 having respective ears 52 and 53. Each arm 50 and 51 is located in the end of the upright member 10 for example, the end 54 and 55 being located in

diametrically opposed arms of the cruciform-like section, thereby securely locating the spigot 13 within the end of the upright member 10 and each upright member is provided with a pair of diametrically opposed cut-outs, one of which is shown at 56, in which the ears 52 and 53 are accommodated.

The spigot 13 may then be secured to the upright 10 by welding around the interengaging surfaces between the ears 52 and 53 and the cut-outs in the upright 10.

The spigot 13 is provided with protruberances 57 and 58, the distances between the outer surfaces of the proruberances 57 and 58 being substantially the same as, but not greater than, the distance between both surfaces of arms 31 and 33 for example of the crucible. It can be seen from the drawings that the spigot 13 is slightly tapered and it is intended that the distance between the outer surfaces of the protruberances 57 and 58 is substantially the same as the distance between the outer surfaces of the spigot 13 adjacent the end of the upright member 10. The protruberances 57 and 58 minimising or eliminating rocking of interconnected members.

Conveniently, the protruberances 57 and 58 may be provided with a shoulder, such as the one illustrated at 59 on protruberance 58, the shoulder 59 may be engaged by a latch member provided on the socket 10, the latch member for example being manually operable to release one member from the other if so desired. Such a latch member could, for example, comprise a spring loaded plunger extending through the side wall of the socket or a pivoting member having an engagement surface for engaging the shoulder 59.

To interconnect one frame member with another, the two frames are brought into contact with each other such that the spigot 13 projects into a socket afforded by one end of another frame member, the two limbs 50 and 51 of the spigot once again engaging within diametrically opposed arms, for example 31 and 33, of the cruciform- like socket afforded by the tubular uprights, the two frames are thus secured to each other in a manner such that rotational movement about the axis 60 between the two frame members is not possible.

In order to prevent undesired separation between the two frame members, as above mentioned, a latch member may be provided on the socket for engagement with protruberances 57 and/or 58. Alternatively or additionally through bores may be provided in the socket part such as the through bore shown at 61, the through bore 61 extending through diametrically opposed sides of the socket such that a pin (not shown) may extend through the through bores 61 through the gap 62 between limbs 50 and 51 of the spigot 13 thereby preventing undesired separation of the two frame members.

It is envisaged that other interlocking means may be provided on the spigot and/or socket operatives such that when the spigot is inserted into the socket the two frames are properly engaged and separation is not possible until some positive action is taken to release the catch mechanism. For example, the socket may be provided with a resiliently biased movable latch adapted to engage within the slot 62 between limbs 50 and 51 of the spigot 13 or a part of the socket respectively, the latch being provided with an operating member such as a push-button or other manually operable part which, when depressed or otherwise moved, moves the latch member out of engagement with the spigot 13 or said part on said socket as the case may be, and hence allows separation of the two frame members.

Interlocking means between a spigot and a socket may be such that not only does insertion of the spigot into the socket cause the two members to be locked together, but release of the interlocking means and separation of the two members may cause re-setting of the interlocking means to ensure that subsequent insertion of a spigot into a socket causes operation of the interlocking means to lock the members together.

Referring now to Figure 7, the scaffold tower in which a plurality of frames such as these shown in Figures 1 and 2 are interconnected with each other to form the tower shown in Figure 7.

Diagonal bracing members 70 and 71 may be provided to provide further rigidity to the tower shown in Figure 7, the construction of the bracing members 70 and 71 being shown in more detail in Figures 8 and 9. The diagonal bracing member 70 shown in Figures 8 and 9 is substantially the same as the diagonal bracing member 71 except that it is longer.

The bracing member 70 comprises a tubular part 72 of rectangular cross-section into which each end thereof is secured a coupling member 73 which is conveniently formed as an aluminium extrusion. The coupling member 73 has a jaw portion 74, the connecting part 75 which is inserted into the tubular member 72 and secured in place, for example by welding, and has lugs 76 and 77 having formed therein aligned through bores. A coupling bolt 78 extends through the through bores in lugs 76 and 77 and is resiliently biased by a helical spring 79 bearing on lug 77 and a pin 980 extending through coupling bolt 78.

In order to connect the diagonal bracing member 70 onto one of the frame members, the coupling bolt 78 is pulled in a direction to withdraw the bolt from the mouth of jaw 74 against the resilient bias of spring 79, the jaw 74 is placed around the member desired and the bolt 78 released thus trapping the member in the mouth of jaw 74.

Since the spigot and socket arrangement of the present invention prevents any relative angular movement about the longitudinal axis of the uprights forming the four corners of the tower, a considerable increase in the rigidity of the tower, and hence the stability, is achieved over those previously known. Furthermore, due to the precise fitting of one frame member relative to another, the relative interlocking of frames by using, for example, a pin passing through gap 62 provided in the socket 13 and diametrically opposed through bores 61 in the socket enables the frames to be interlocked with each other in a simple manner.

Whereas the invention has been specifically described with reference to the drawings in relation to a scaffold tower, it is envisaged that the arrange-

ment of the interconnecting spigot and socket is equally applicable to any form of scaffolding and any other load supporting framework in which ease of assembly and rigidity of structure is desirable.

The spigot 13 may be made as an elongate extrusion which is cut or otherwise separated into spigots 13 for securing into the upright members 10.

The cross-section of the section at right angles to the length would be as shown in Figure 5.

CLAIMS

1. A load supporting structure comprising a plurality of members each of which is adapted to be secured to another of said members to form said structure, at least one of said members comprising a socket part and another of said members comprising a spigot part, the dimensions of which parts enable the spigot part to be inserted into the socket part, the form of the socket part and said spigot being such that relative rotation between the respective members comprising the socket part and the spigot part about an axis along which the relative parts are moved into and out of assembled relationship is prevented.

2. A load supporting structure as claimed in Claim 1 wherein the form of said socket part and said spigot part enables the respective members carrying said parts to be assembled in a plurality of different angular positions.

3. A load supporting structure as claimed in Claim 2 wherein in a plane substantially at right angles to said axis, said socket part is of cruciform cross-section.

4. A load supporting structure as claimed in any one of the preceding claims wherein in a plane substantially at right angles to said axis, said spigot part is of rectangular cross-section.

5. A load supporting structure as claimed in Claim 4 when appendant to Claim 3 wherein said spigot is adapted to engage within at least one pair of opposed arms of said cruciform.

6. A load supporting as claimed in any one of the preceding claims wherein said spigot comprises a pair of spaced elements interconnected at least at one end to provide a cross-section of substantially rectangular outline and defining a gap provided by the spacing of said elements intermediate the ends of the rectangle.

7. A load supporting structure as claimed in any one of the preceding claims wherein the socket part has an outer surface having a configuration different from that of its inner surface.

8. A load supporting structure as claimed in Claim 7 wherein the cross-sectional shape, at right angles to said axis, of the outer surface of said socket part is substantially circular.

9. A load supporting structure as claimed in any one of the preceding claims wherein each spigot is formed from extrusion stock separated along planes parallel to said axis.

10. A load supporting structure as claimed in Claim 9 wherein said spigot is formed from an aluminium alloy.

11. A load supporting structure as claimed in any one of the preceding claims wherein said member comprising a socket part is an extrusion.

12. A load supporting structure as claimed in Claim 11 wherein said member comprising a socket part is an aluminium extrusion.

13. A load supporting structure as claimed in any one of the preceding claims wherein said spigot is secured to an elongate member by insertion of part of said spigot into said elongate member and welding of said spigot part to said elongate member.

14. A load supporting structure as claimed in Claim 13 wherein said elongate member comprises a member defining said socket part.

15. A load supporting structure as claimed in Claim 14 wherein said elongate member comprises at one of its ends a spigot part and at the other of its ends a socket part.

16. A load supporting structure as claimed in Claim 15 wherein said spigot part is provided with protruberances diametrically opposite each other relative to said axis and spaced from said elongate member, the configuration of said spigot being such that the distance between the outer surfaces of said protruberances from each other and the distance between outer surfaces of said spigot part adjacent said elongate member from each other is substantially the same.

17. A load supporting structure as claimed in Claim 3 wherein said socket part is provided with notches between adjacent arms of said cruciform.

18. A load supporting structure comprising a pair of scaffold elements adapted to be connected to each other, one of said elements defining a socket and the other a spigot, the dimensions and form of said socket and said spigot being such that they may be moved into and out of assembled relationship with each other along an axis and, when in assembled relationship defined by insertion of said spigot into said socket relative angular movement between said elements about said axis being prevented.

19. A load supporting structure as claimed in any one of Claims 1 to 17 wherein said members comprise scaffold members.

20. A load supporting structure comprising a scaffold tower having at least three sides and at least partially assembled from scaffolding frame work or sub-assemblies, wherein each sub-assembly or framework comrpises a pair of tubular upright members adapted to extend with their longitudinal axes substantially vertical when in assembled relationship, said upright tubular members being interconnected by a connecting member, one or each of the tubular upright members being provided with a spigot, the other end of said one or each of the tubular members being provided with a socket, wherein the configuration of the spigot and socket permits of interconnection between adjacent frames by insertion of the spigot of one frame into the socket of another and, on connection prevents relative rotation between adjacent connected frames about the longitudinal axis of the interconnected tubular members.

21. A load supporting structure as claimed in any one of Claims 1 to 17 wherein said members comprise scaffolding framework of sub-assemblies,

each such framework or sub-assembly being provided with at least one socket part and at least one spigot part.

22. A load supporting structure as claimed in any one of Claims 1 to 21 wherein locking means are provided to prevent separation of interengaged spigot and socket parts.

23. A load supporting structure as claimed in Claim 22 wherein said locking means comprises a movable member mounted relative to said socket part and engageable with protruberances on said spigot part.

24. A load supporting structure as claimed in Claim 21 wherein said locking means comprises a pin passing through said socket transversely to said axis and engaging with said spigot.

25. A load supporting structure as claimed in Claim 21 further comprising bracing members substantially as hereinbefore described and shown with reference to Figures 8 and 9 of the accompanying drawings.

26. A load supporting structure substantially as hereinbefore described with reference to and as illustrated in Figures 1, 2 and 3 of the accompanying drawings.

27. A load supporting structure substantially as hereinbefore described, the spigots and/or sockets of which are substantially the same as those shown in Figures 4, 5 and 6 of the accompanying drawings.

28. A scaffold tower substantially as hereinbefore described with reference to and as illustrated in Figure 7 of the accompanying drawings.

29. A load supporting structure including any novel feature or novel combination of features disclosed herein and/or shown in the accompanying drawings.

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